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COSTS AND COST SAVINGS DUE TO LABORATORY REALIGNMENTS

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Deputy Director, Defense Research and Engineering
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This Paper has been reviewed by IDA to assure that it meets high standards of thoroughness, objectivity, and appropriate analytical methodology and that the results, conclusions and recommendations are properly supported by the material presented.

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The Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories is reviewing proposals for realigning several DoD research facilities. In support of this review, the military services were asked to provide the Commission with estimates of the costs and savings that would result from these realignments. IDA reviewed the estimates submitted by the services, as well as those made by opponents of the various realignments, in order to assess their accuracy. Included in the review were analyses of the services' cost-estimating documentation and methodology and an assessment of COBRA, the model used by the services for estimating costs (as directed by the OSD). In addition, IDA investigated pertinent aspects of the proposed realignments of the following laboratories: the Army Combat Materiel Research Laboratory, the Naval Air Development Center, the Naval Underwater Systems Center-New London, the Naval Surface Weapons Center-White Oak, the David Taylor Research Center-Annapolis, and the Aircrew Training Research Facility at Williams Air Force Base. IDA found the services' cost and savings estimates to be reasonable and in accordance with established procedures for base closures. Several shortcomings of the COBRA model methodology were identified, but their effects did not significantly alter service findings and recommendations. Proposed realignments are essentially cost neutral, having estimated payback periods of between 9 and 18 years. In this regard, IDA believes realignment decisions should be based solely on effectiveness considerations.

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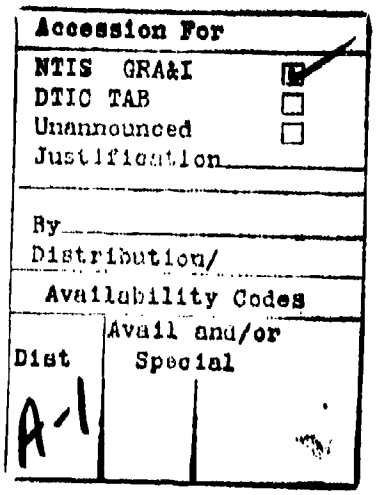
PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) for the Deputy Director for Research and Engineering (Research and Advanced Technology), under contract MDA 903 89 C 0003, Task Order T-D7-730, issued 26 July 1989, as amended. The objective of the task was to test the reasonableness of the military services' estimates of the cost to realign specific research facilities. This work was done for the Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories.

This paper was reviewed within IDA by Stanley A. Horowitz, Thomas C. Varley, and Thomas P. Christie.



EXECUTIVE SUMMARY

The Institute for Defense Analyses (IDA) was asked to assist the Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories in the review of the cost and savings estimates submitted by the military services in support of research facilities realignment. IDA reviewed documentation provided to the Commission by the services and by the opponents of specific laboratory realignments. IDA then performed an investigation of the general methodologies and assumptions used in preparing the cost estimates, particularly those inherent in the Cost of Base Realignment Action (COBRA) model. Finally, detailed investigations were made into the costs and savings of a selected set of installations scheduled for consolidation: the Army Combat Materiel Research Laboratory, the Naval Air Development Center, the Naval Underwater Systems Center-New London, the Naval Surface Weapons Center-White Oak, the David Taylor Research Center-Annapolis, and the Aircrew Training Research Facility at Williams Air Force Base (AFB). The results of these specific investigations are detailed in the body of this paper.

We found that, in general, the services' cost estimates were in accordance with established procedures for base closures and were reasonable. We identified several limitations with the services' cost-estimating methodologies, particularly those relating to the COBRA model. However, such limitations, both individually and collectively, were not sufficient to change recommendations or to significantly alter cost and savings estimates.

In investigating one-time costs, we paid particular attention to insure all relevant cost elements and associated dollars were included. The validity of offsetting cost avoidances was also assessed. While we found no major cost problems, we did identify several areas that required additional analysis.

In reviewing the services' methodology, we found that the major component of one-time costs is the cost of constructing replacement facilities. In contrast, the marginal costs associated with the percentages of personnel moving, retiring, resigning, finding other Federal employment, etc., while contentious, are not major cost drivers. Independent

of the effectiveness factor, one-time personnel costs are generally about the same whether or not people move.

We evaluated the cost estimates for Navy construction by comparing the current plant value of research facilities at the "losing" installation (old location) with the COBRA model cost estimates of constructing replacement facilities at both the losing and "gaining" (new location) installations. The costs per square foot in the COBRA estimates and those derived from the current plant value were reasonably close, and we concluded that the estimates were reasonable. The Army did not use the COBRA factors because it performed a detailed analysis of construction costs for its proposed Combat Materiel Research Laboratory at Adelphi, MD, and at Aberdeen Proving Ground. The cost for these highly specialized technical facilities was from two to five times as high as the standard COBRA factor estimates. This illustrates the potential need of performing more detailed analyses for unique situations. The COBRA model uses standard factors for "average" requirements. If there is a requirement that differs significantly from the average, such as a highly specialized and costly technical laboratory, the COBRA factors would have to be adjusted.

Realignment savings usually result from reducing personnel authorizations, which lowers payroll costs and related overhead costs. In the case of the research facilities reviewed, the personnel savings accrued mostly from a reduction in civilian spaces. Overall, personnel savings were reasonably calculated using the standard COBRA methodology.

Some realignment opponents questioned the validity of claiming as consolidation savings those personnel reductions that were also attributable to the congressionally-mandated 20% reduction. The Navy apparently used savings from consolidations as a means for achieving a portion of the 20% reduction. However, for cost purposes, the Navy treated the mandated and realignment reductions separately. We also segregated the two actions. We limited our assessment to only those costs and savings associated with realignments after satisfying ourselves that there was no "double counting" between the two categories.

In general, we found the COBRA model provided reasonable cost and savings estimates for the realignment actions we reviewed. However, we noted four principal limitations with the COBRA cost model. First, documentation has not been updated since 1989 even though there have been about 30 modifications to the model since that time. Second, the data base that supports the standard factors used in the model is very limited,

casting doubt on the validity of the factors and fueling arguments posed by opponents of base closures. Third, COBRA is not designed to handle the simultaneous realignment of multiple installations. Fourth, the COBRA structure cannot be easily modified to accommodate facts of life in lieu of standard factors; this leads to workarounds that defeat the purpose of a standard model.

In general, the proposed laboratory realignments take long times to pay for themselves (9-18 years), even if everything goes according to plan. More likely, some of the uncertainties will drive costs up or savings down, and extend the break-even point. The bottom line is that the realignments do not save large amounts of money. If cost savings were the only basis for proposing these realignments, the decision to undertake them would be questionable. More fundamentally, however, the realignments are theoretically designed to provide more relevent technology, and over the long haul, they will not be money losing propositions. To the extent that this occurs, the decision to realign can be viewed as an effectiveness decision with cost considerations being neutral.

Our finding that the services' estimates of costs and savings were reasonable was presented to the Commission in a briefing on 12 September 1991.

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I. INTRODUCTION

A. BACKGROUND

The 1991 Defense Base Closure and Realignment Commision has the primary responsibility to the President and Congress in proposing changes to close and realign Department of Defense (DoD) bases. The Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories was formed specifically to assess the impact of any laboratory closure and realignment actions. The Advisory Commission was to report the results of its review to the Secretary of Defense by 30 September 1991, and to Congress by 31 October 1991. During the work of these commissions, many questions had surfaced regarding the cost and savings estimates prepared by the services in support of the recommended closures and realingments. These questions were raised by various interested parties, including congressional representatives, special interest community groups, and the General Accounting Office (GAO).

On 13 August 1991, the Deputy Director for Research and Engineering (Research and Advanced Technology), as Executive Secretary of the Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories (hereafter referred to as the "Laboratory Commission"), asked the Insitute for Defense Analysis (IDA) to perform certain cost analyses. These involved reviewing the military services' recommendations to the Laboratory Commission (and the arguments of opponents), investigating the methodologies and assumptions the services made in preparing their estimates of costs and cost savings associated with some of the laboratory realignments, and testing the sensitivity of costs and savings to the assumptions made. During the three weeks available for investigation, IDA also performed more detailed analyses for selected research facilities, to the extent that the constraints of the short time and the available information allowed.

B. SCOPE

The laboratories chosen and their proposed realignment locations are shown in Table 1.

Table 1. Selected Research Facilities and Their Proposed Realignments

Service	Facility	Current Location	Primary Gaining Location(s)
Army	Combat Material Research Laboratory (CMRL)	Various	Adelphi, MD Aberdeen Proving Grounds
Navy	Naval Air Development Center (NADC)	Warminster, PA	Patuxent River, MD St. Inigoes, MD
	Naval Underwater Systems Center (NUSC)	New London, CT	Newport, RI
	Naval Surface Weapons Center (NSWC)	White Oak, MD	Dahlgren, VA
	David Taylor Research Center	Annapolis, MD	Bethesda, MD
Air Force	Aircrew Training Research Facility	Williams AFB, AZ	Orlando, FL

The emphasis was on Navy facilities because the Defense Base Closure and Realignment Commission (BRAC) and the GAO had had difficulty with the Navy's documentation, and because members of Congress and local civic interest groups had raised questions about the accuracy of the Navy's costs.

Our review was confined to an assessment of the cost estimates and any resulting savings from realignment. We did not review any other issues, including the critical concern regarding the impact of realignment on laboratory effectiveness. Ideally, we would have preferred to compare the costs of alternatives that have equal levels of effectiveness. This could not be done, because laboratory effectiveness is nearly impossible to measure and because such assessments were explicitly excluded from our task. All potential differences in effectiveness that might accrue to the competing scenarios were left for the services and the Commission to determine. We also did not assess the reasonableness of the claimed number of personnel authorizations being eliminated by realignment. We accepted the services' manpower estimates and focused on the costs and savings that would accrue given those estimates.

During the same period that the base closure and realignment process was being administered, the services were developing plans to implement the congressionally-mandated 20% cut in acquisition personnel. The mandate did not include any specific

direction on how the personnel reduction was to be achieved. Therefore, the services could elect to cut organizations by a flat 20% or vary the percentage reductions by organization. In the case of laboratories, the Navy appears to have directed varying percentage cuts by organization that were less than the 20% level. The Navy then considered laboratory realignments and attendant personnel reductions and savings as a separate cost issue, although, in some cases, the combined general and realignment reductions came to around 20%. In our review, we also segregated the two actions. We limited our assessments to only those costs and savings associated with realignments after satisfying ourselves that there was no "double counting" of costs and savings between the two categories.

IDA reviewed documentation provided by the Laboratory Commission, the services, the GAO, and the local opponents of specific consolidations. This information was summary in nature, and neither the service representatives we talked with nor the opponents of moves had documented justification for the requirements that drive cost estimates, such as manpower for personnel or square footage for construction. Time did not permit on-site visits or the validation of the stated requirements. Within the constraints outlined, IDA performed an independent *review* of the cost estimates associated with the proposed laboratory consolidations. An independent cost estimate was not requested or performed.

C. OUTLINE OF THE REPORT

Section II of this document discusses the limitations of the current cost model used to determine costs and savings associated with base closures, consolidations, and conversions. In Section III, we explain the cost methodology the services employed. Section IV discusses two cost issues that are common to all the cost analyses we reviewed. The final section discusses the investigation of the cost analyses performed for each of the research facilities in Table 1.

II. COBRA MODEL APPLICATIONS

A. BACKGROUND

The Office of the Secretary of Defense (OSD) directed the services to use the current version of the Cost of Base Realignment Action (COBRA) model in their cost estimates. A prior version of the COBRA model was used for the 1988 Base Closure Commission. The model was developed by the Logistics Management Institute (LMI)[1] to provide cost comparisons of potential installation closures and realignments. Given the sensitive nature of proposed base changes, both from community and political standpoints, it was essential that the data be collected and analyzed by the service staff without extensive and detailed field studies. It was also important that the model provide a consistent framework to be used by all the service organizations to enhance objectivity and comparability. The result was a generic model that covers general or average type realignment actions and allows, at least partially, the input of unique requirements and the capability to accommodate specific scenarios that deviate from the COBRA averages.

The COBRA model estimates the costs, savings, and return on investment for any closure or realignment action. Annual costs and savings are calculated according to their frequency (one time or recurring) and by their cost elements (nature of the expense, e.g., personnel, construction, overhead). The model uses algorithms based on standard information within the model combined with base-specific data input by the user. The resulting calculations produce one-time costs as standard charges. Recurring costs and savings are derived by comparing the costs of functions at the "losing" (old location) and "gaining" (new location) bases and estimating the costs of the transferred services at the new location.

Costs are calculated in terms of constant dollars (net of inflation) and are discounted at the standard DoD rate of 10% computed on a mid-year basis. Net present value (NPV),

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1 Douglas M. Brown, "COBRA: The Base Closure Model," Logistics Management Institute, Report PL809R1, May 1989. Additional COBRA descriptions can usually be found within each of the Services. For example, the Chief of Naval Operations (OP-443) has prepared "COBRA Model Overview," dated 20 May 1991, which provides a clear and concise summary description.

also referred to as discounted cash flow, is computed for a twenty-year period. If net cumulative savings exceed net cumulative costs after discounting, there is a positive or favorable NPV. Conversely, if cumulative net costs exceed cumulative net savings after discounting, NPV is negative and the investment is unfavorable. The model also calculates the years to break even, i.e., the number of years from when realignment starts to when net present value equals zero. COBRA also shows the total return on investment (ROI) years, which is the number of years from when realignment is completed to when net present value equals zero.

B. LIMITATIONS

In general, we found the COBRA model provided reasonable cost and savings estimates for the realignment actions we reviewed. However, although the model has been continually improved upon since the original version was released, some deficiencies still exist. These deficiencies should be corrected to enhance model utility in future realignment and closure reviews.

We noted four principal limitations. First, the model documentation has not been updated since 1989 in spite of at least 30 modifications of the model. We found that not only we, but also cost analysts in the field, had difficulty understanding all of the methodology employed within the model, since it is a "black box" without visibly explicit algorithms.

The second major limitation is the absence of a data base that supports the many factors employed by the COBRA model. Some analysts claim that a number of percentages (e.g., 6.5% of affected personnel will not move because they do not have positions at the gaining facility) have been derived from statistics collected at a single base closure, that of Pease AFB, New Hampshire. Although many of these percentages do not in fact make much difference in costs per se, they were seized upon by opponents of realignment as reasons to question the model's validity. Ideally, a good supporting data base would allow cost analysts to choose default factors based on particular economic and geographic assumptions.

A third limitation is the inability of COBRA to keep track of the costs associated with the realignment of several losing facilities and several gaining facilities comprising a single option. Currently the model costs the effects of a realignment option as if it involved only one losing installation and one gaining one. Because of economies of scale calculated

internally in the model, adding the sum of the parts of a multiple-installation realignment costed by the current COBRA model does not give an accurate answer.

The fourth limitation is that analysts cannot modify the structure of COBRA to accommodate facts of life. For example, in the laboratory realignments it was necessary to capture the costs of moving special research equipment. There was no place in the model's structure to do this. The only place to put these costs was as a throughput under a category called "Environmental Mitigation." This gives the appearance of being inaccurate and defeats attempts to make comparisons. Similarly, since the model uses standard factors for construction costs, analysts with specific construction cost estimates, such as those at U.S. Army Laboratory Command, had to specify an artificial required number of square feet in order to achieve other-than-standard costs. The model cannot handle a precise estimate of the phasing of costs inasmuch as this is determined internally by standard percentages.

Because of the absence of documentation and a supporting data base, we were unable to verify all of the algorithms used in the COBRA model. However, we believe that the algorithms, and the standard factors, may be too general to fit all situations. The model was developed as a "broad brush" treatment to compare various options involving closure or realignment of a given installation. In this mode, it appears to provide satisfactory results. However, if more precise cost estimating is required, a different or improved model would have to be developed.

III. SERVICE COST METHODOLOGY

The methodology employed by the military services in estimating realignment costs and savings needs to be discussed in the context of base closure exercises. In selecting facilities for consolidation or conversion, each of the services emphasizes the current and future military value of various realignment options. These options must address present and future mission requirements and the impact on operational readiness. Analysts then estimate the physical requirements that result from each option. The requirements impacting cost (known as cost drivers, e.g., numbers of various categories of impacted employees, or square feet of various types of construction) became inputs to the COBRA model. The model contains standard factors for each service that generate constant dollar costs when applied against the cost drivers.

The COBRA output includes streams of marginal costs, savings, and discounted net differences. In the process of selecting the best military option, decision makers examine the cumulative discounted net costs for such statistics as a reasonable discounted return on investment (ROI) payback period.

The costs that result from the COBRA model are primarily one-time costs. The savings almost exclusively result from the number of personnel authorizations (principally civilian in the case of laboratories) that can be deleted due to the option. If an otherwise attractive military realignment option has an unsatisfactory payback period, an attempt may be made to reduce its costs or increase its savings. (Reducing costs is generally preferable because losing more people would more directly hurt effectiveness.)

A legitimate way to reduce one-time costs is to not move a part of an organization that would be particularly expensive to reconstitute at the gaining installation. The Navy appears to have employed this means at every Navy activity we investigated, in that a portion of the research activity remains at the losing installation. Although the logic of doing this is challenged by groups opposing particular laboratory realignments, this issue is concerned with efficiency and effectiveness; it is not a cost-estimating issue.

In the next section (IV), we discuss two generic cost issues that affect each of the individual estimates we reviewed. Specific base and organizational cost issues are considered in Section V.

IV. GENERIC COST ISSUES

A. MILITARY CONSTRUCTION COSTS

The major component of one-time costs is the military construction required to provide the facilities needed at the gaining installation. Figure 1 shows the relative predominance of construction costs in base realignments.

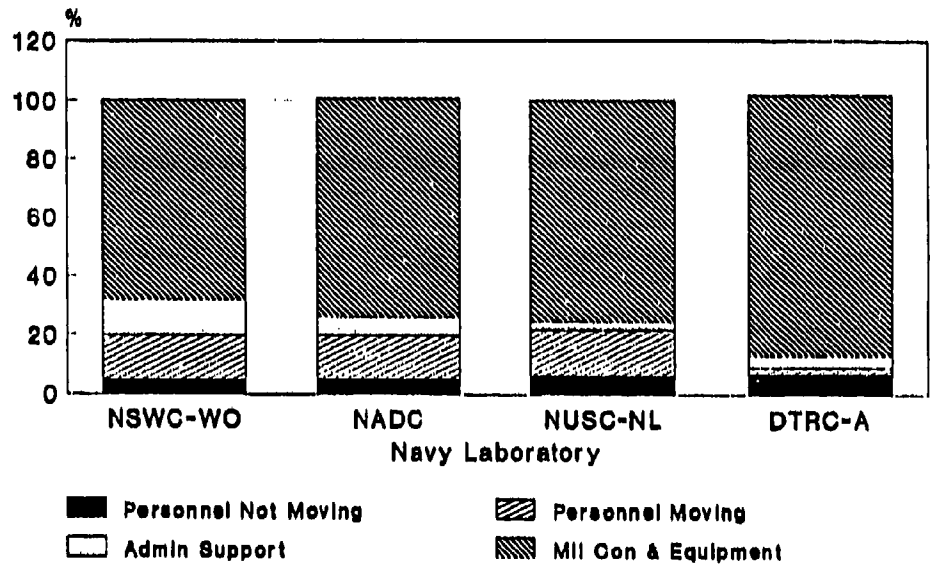

Figure 1. One-Time Costs as a Percentage of Total

1. COBRA Model Factors

Construction costs are usually measured in terms of dollars per square foot and can vary significantly depending on the type of facility being constructed, on whether it is for new facilities or modification to existing facilities and on the geographical location of the work to be performed. The COBRA model accounts for these differences with standard factors from which the user can choose. For example, the Navy used the research, development, test and evaluation (RDT&E) category ($136 per square foot) for the type of new building when the construction was laboratory-related. If the facility was largely to

house a support function, the administrative category was selected ($98 per square foot). A 53% charge was then added to the basic facility cost to cover design, site preparation and other indirect costs. If construction involved modification of existing facilities, the above factors were adjusted to 60% of the new cost. Finally, the COBRA model applied a geographical factor to adjust for regional cost differences (e.g., Dahlgren, VA-94%, Newport, RI-112%).

The resulting factors before applying the geographical factor are as follows:

New RDT&E Facility	$208 per square foot
Modification to RDT&E	$125 per square foot
Administrative Facility	$150 per square foot
Modification to Administrative	$ 90 per square foot.

2. Cost Assessment

During our review of the services' methodologies in estimating construction costs, we noted that the Navy elected to use the COBRA model for the installations we reviewed, while the Army chose to use more detailed estimates prepared by the Army Corps of Engineers (COE) for the Combat Material Research Laboratory (CMRL). (Construction was not an issue in the Air Force's Aircrew Training Research Facility move.) Our objectives were to assess the reasonableness of the individual Navy and Army estimates as well as to understand the reasons why their approaches and results varied so much.

We analyzed the reasonableness of the Navy estimates by comparing current estimated costs of facilities at the losing installation with the COBRA-estimated construction costs at the new location. We used current plant value (CPV) to estimate current facility costs, at both the old and new locations. CPV consists of the original cost to construct plus subsequent improvement costs, which are then adjusted for inflation to produce a current year value. We recognize that CPV is neither a precise measurement nor is it necessarily indicative of current economic conditions and is therefore of limited use in projecting future costs. Accordingly, we used CPV only as a reasonable "ballpark" check. The CPV of scientific and technical buildings already in place at the losing installations were compared (using dollars per square foot) to the COBRA estimates for constructing similar type facilities at the losing and gaining installations. The result implies that these Navy estimates are consistent and appear to be reasonable. In effect, the Navy determined that the standard factors for average requirements in the COBRA model adequately reflected the specific requirements for replacement facilities.

The Army, on the other hand, decided that some of its replacement facilities were significantly different than the COBRA-generated averages. At Headquarters, Army Laboratory Command, we obtained cost estimates prepared by the Army COE for the Army consolidation forming the CMRL with locations at both Adelphi and Aberdeen Proving Ground, MD. These estimates were tailored tc specific construction requirements in the consolidation. However, CPV costs for Army and Navy RDT&E facilities are, on average, about the same. Even in the case of CMRL administrative and support facilities, the COE and COBRA estimates are similar; only the laboratory construction costs were significantly different.

The average of the laboratory-only construction at Aberdeen Proving Ground (APG) is $420 per square foot (FY 1992 dollars). Two special labs are being built at Adelphi with an average cost per square foot of $1,029. Thus, the Army's estimates are two to five times that of the Navy's estimate of $208 per square foot. The Army approach implies that, although the Navy estimates are consistent with the CPV values at their current labs, construction costs for specific laboratories may vary considerably, and more detailed analyses may be necessary when requirements vary significantly from the COBRA averages. A comparison of Navy COBRA model estimates with current plant value is shown in Figure 2.

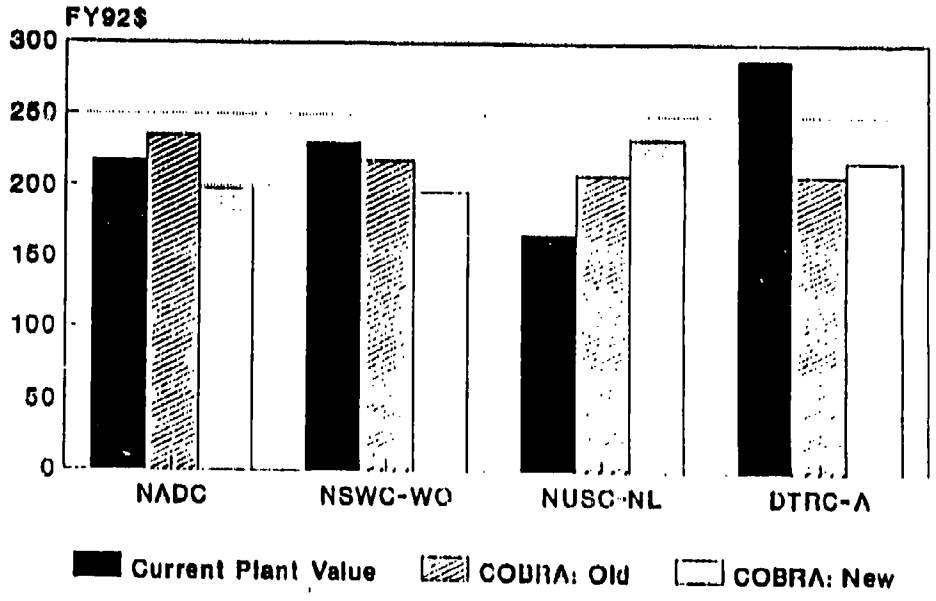

Figure 2. Laboratory Construction Costs (Comparison of Dollars per Square Foot)

An analysis of construction documents supporting the FY 1991-92 budget requests shows RDT&E project costs per square foot ranging from $95 to $13,110 with an average of $347. If construction costs for one large rocket test cell are not included, the average cost per square foot is $200.

As a test of sensitivity, we used the APG cost of $420 per square foot to estimate the cost of new laboratory construction at Newport as a result of the NUSC-New London, consolidation. The one-time discounted costs were then so high that the discounted savings would never pay back the investment, as illustrated in Figure 3. The same would hold true for the other Navy labs investigated. However, research facilities differ, and laboratories can be designed to meet the Navy estimate. (Similarly, if the Army cost estimates are high, then their forecasted savings from consolidation are understated.) We found no hard evidence to support a conclusion that the Navy estimate was understated or the Army estimate was overstated.

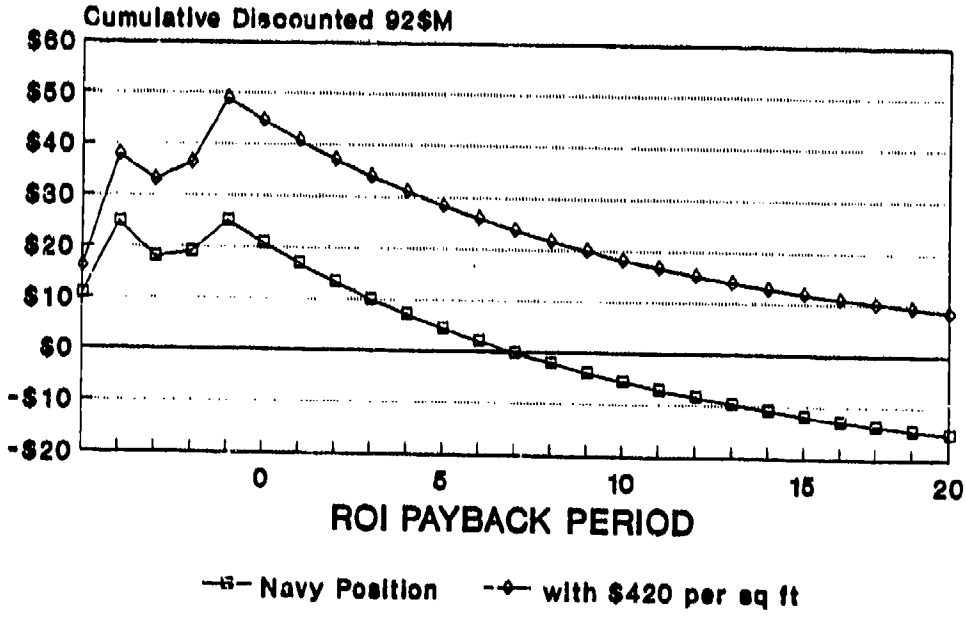

Figure 3. Analysis Showing Sensitivity to Construction Pricing (Sensitivity to Cost per Square Foot)

We attributed the large difference between Navy and Army costs per square foot to the differences in facilities to be constructed. In the case of the Navy, the facilities tend to represent the full spectrum of research and development (R&D) facilities, less those particularly expensive facilities the Navy explicitly opted not to move. The Army facilities

to be constructed tend to be dominated by the expensive, highly specialized structures that are not representative of the COBRA average. The bottom line is that both the Navy and Army estimates appear reasonable.

B. CIVILIAN PERSONNEL SAVINGS

Section 902 of Title IX of the National Defense Authorization Act for Fiscal Year 1991 requires a 4% reduction per year during the next five fiscal years in civilian and military personnel in acquisition activities. The Navy appears to have considered consolidation reductions along with the congressional ones. This is illustrated in Figure 4, where the first bar represents the total congressionally-mandated reduction (20%). The second bar (prior reduction) shows what the Navy attributes to the directed reduction (Section 902), and the third what it attributes to consolidation savings. In all cases the second bar (directed reduction) is less than 20%. For the last three laboratories depicted in the figure, the sum of the second and third bars (i.e., directed reduction plus consolidation savings), shown as a fourth bar, is approximately equal to the already mandated reduction.

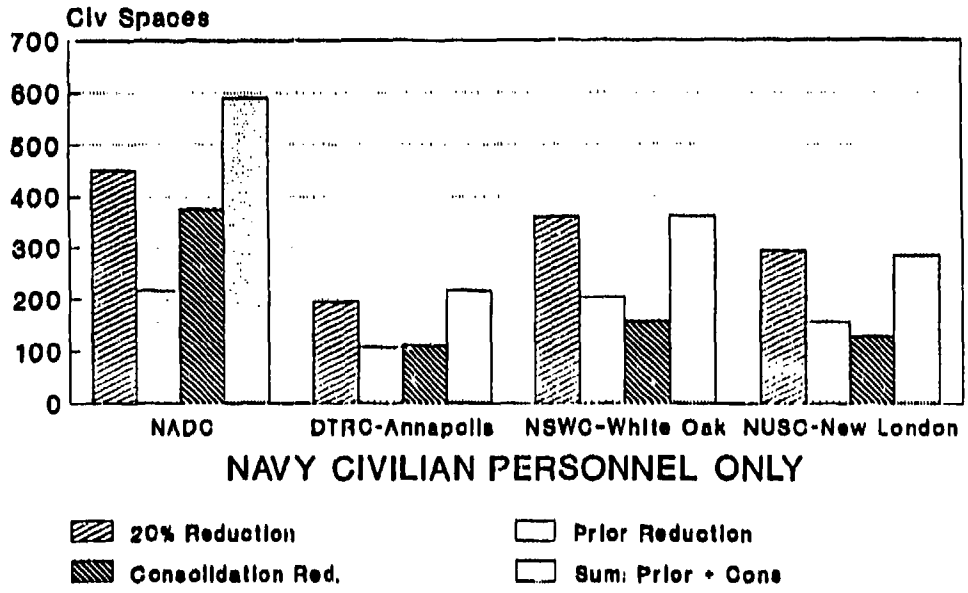

Figure 4. Effect of Mandatory Personnel Reductions

If the manpower savings from consolidation were disallowed, none of the consolidations we investigated would be economically viable, as was pointed out by several opponents of consolidation. On the other hand, faced with reductions of 20% over

five years, one of the best ways to reduce the negative impact may be to achieve efficiencies through realignment. As previously indicated, we included all costs and savings associated with realignment in our review.

V. INSTALLATION-SPECIFIC COSTS

Members of Congress representing four locations that stand to lose sizeable portions of their R&D activity due to realignment have challenged Navy cost estimates. The losing locations are the Naval Air Development Center at Warminster, PA, the Naval Underwater Systems Center Detachment at New London, CT, the Naval Surface Weapons Center Detachment at White Oak, MD, and the David Taylor Research Center Activity at Annapolis, MD. IDA analyzed realignments involving these installations in as much detail as could be obtained in the limited time available.

A. NAVAL AIR DEVELOPMENT CENTER, WARMINSTER

1. Background

The Navy has proposed moving most of the Naval Air Development Center (NADC), currently located in Warminster, PA, to the newly created Naval Air Warfare Center (NAWC) at Patuxent River, MD. The realignment consolidates the research and development functions at NADC with the related test functions at the current Naval Air Test Center (NATC) at Patuxent, which will also become part of NAWC. This portion of the proposed NADC move involves the transfer of 1,559 civilian positions and 143 military positions. The Navy also intends to use some of the available facilities at the Naval Electronics Systems Activity in St. Inigoes, MD, which is located a short distance from the Patuxent River.

As part of the realignment, an additional 21 civilian positions will be transferred to the Naval Weapons Center in China Lake, CA, and 25 civilian positions to the Pacific Missile Test Center in Point Mugu, CA. This results in a total transfer of 1,605 civilian positions. Another 274 positions will be retained at Warminster to support navigation functions being transferred to the Space and Naval Warfare Systems Command (SPAWAR) activity at Warminster, and the man-rated centrifuge facility will be retained in caretaker status by NADC. The Navy chose not to move these functions because of the high costs to duplicate the facilities and equipment at a new site.

The proposed realignment allows the Navy to eliminate 466 positions consisting of 374 civilian and 92 military positions. The numbers and types of positions identified for elimination were selected by technical and support teams from NADC, NATC, and the Naval Air Systems Command (NAVAIR). As a separate action, another 217 positions were eliminated due to a research and development workload reduction (Section 902 mandatory reduction). Using standard factors, the COBRA model estimates that 985 civilian personnel will move, leaving an estimated 620 personnel to be hired. The COBRA projection of 994 people not moving consists of 378 people retiring (19.1%), 249 people quitting (12.6%), 175 people finding other federal employment (8.8%), 129 people leaving due to a reduction in force (6.5%), and 63 people entering the priority placement program.

The Navy estimated the costs and savings of the proposed move by using the COBRA model. The Delaware Valley Science and Technology Association (DVSTA), a regional group of some 40 defense contractors, strongly opposes the realignment and has taken issue with several elements of the Navy cost estimate. Our analysis focused on the differing cost methodologies used by the Navy and by DVSTA, and on the resulting differences in their costs.

2. Items Reviewed

Our focus was on significant one-time costs and savings and recurring savings. Within the personnel area, we largely looked at the implications for civilian personnel since they constituted about 90% of total authorizations and about 80% of the positions being eliminated. The loss of 92 military positions from consolidation results in additional moving costs of under $1 million and produces annual recurring savings of $3.7 million (in salaries) or about 15% of total savings. We did not perform a detailed review of the military personnel expense.

We reviewed the general documentation described in Section I and four more specific NADC-related sources. First, we used the COBRA cost and savings data obtained from the Navy staff as the baseline for analysis. Second, we reviewed "Analysis of Proposed NADC Relocation" (undated), a report prepared by DVSTA. The DVSTA report challenged and questioned many of the Navy assumptions and offered its own version of costs, savings, and ROI analysis. Third, we reviewed the Navy response to the DVSTA questions and assertions in a document titled "Navy Comments on the DVSTA Analysis of Proposed NADC Relocation (Undated) for the Base Closure and Realignment Commission," dated 24 June 1991. The Navy document provided many additional details

to support their financial analysis. Fourth, we discussed the Navy analysis with the Navy headquarters and NAVAIR staffs.

3. Major Findings

A comparison of the Navy and DVSTA cost, savings, and ROI analysis is shown in Table 2. Note that in those cases where the Navy and DVSTA estimates agree, it was usually due to DVSTA's inability to make an assessment of its own because of lack of data.

Table 2. NADC Cost Comparison (Millions of FY 1992 Dollars)

	Navy	DVSTA
Nonrecurring Costs and Savings		
Costs		
New Construction	115.9	160.0
Moving	25.8	92.0
Personnel	10.6	10.0
Other	32.0	32.0
Environmental Clean-up		10.0
Total	184.3	304.0
Savings		
Construction Avoidance	10.7	10.7
Procurement Avoidance	5.6	5.6
Total	16.3	16.3
Net Nonrecurring	168.0	287.7
Recurring Savings		
Military Salaries	3.7	
Civilian Salaries	15.5	
Overhead	6.0	
Total Recurring	25.2	5.2
Payback Period for ROI (Years)	9	60

There are two major findings. First, the Navy estimates for costs, savings, and ROI are reasonable approximations of the proposed realignment. In all cases where there are differences between the Navy and DVSTA estimates, the Navy estimates were determined to be the preferred alternative. The specific reasons for the determination is included within the second major finding shown below. However, there is one qualification regarding the Navy estimate. The estimate is based on the assumption that the facilities at the Naval Electronic Systems Engineering Activity (NESEA), located in St. Inigoes, MD, will be available for NADC functional use. At one time the Navy planned to

move NESEA to Portsmouth, VA, and close the St. Inigoes facility. This plan is now on hold and the Navy is exploring other potential sites for the NESEA transfer. If the move does not occur prior to the NADC transfer, the Navy estimates that an additional $37.7 million (in then-year dollars) in construction costs may be incurred. This would decrease the net present value by about $23 million and add 6 years to the payback period.

The second major finding is that the DVSTA cost analysis is less accurate than the Navy estimate for several reasons. Construction costs appear to be too high because of excess square footage requirements and pricing. DVSTA estimates that a total of approximately 1.25 million square feet would be needed, which includes about 800 thousand square feet in new laboratory space. DVSTA also priced the entire space at $200 per square foot, which is about the estimated price for laboratories alone. No adjustment was made for administrative space or for modifications to existing facilities, which are estimated to be cheaper by about 25% and 40%, respectively. The Navy performed a detailed requirements analysis that showed only about 1 million square feet would be needed in total (including about 400 thousand for new laboratory space). The Navy segregated administrative and laboratory space and available existing buildings that can be used after modification, and priced all categories accordingly.

The DVSTA estimate for moving costs is also high. DVSTA assumes all 1,605 positions being transferred will incur moving costs. It is expected that many will retire, find other jobs, or terminate employment and not move. DVSTA also uses an average cost per person moving of $50,000 that the Federal Acquisition Regulations (FAR) prescribe for estimating contract costs associated with moving contractor employees. The Navy projects that 985 personnel will move and uses transportation cost factors in the COBRA model developed specifically for DoD personnel movements. This results in an average cost of about $25,000 per person.

DVSTA believes that the Navy should include about $10 million in environmental clean-up costs. The Navy position is that removing the hazardous waste must be done whether there is a realignment or not; therefore, such costs are not chargeable to the realignment. The DVSTA apparently does not challenge the estimated recurring savings of $25.2 million per year. Rather, DVSTA estimates about $20 million would be saved even if there was no realignment because of the congressionally-mandated 20% reduction in acquisition personnel. With that approach, the recurring savings applicable to the realignment would only be the difference ($5.2 million). We concur with the Navy estimate, which includes the full $25.2 million in savings, since the realignment is one of

the principal means for the Navy to achieve the reduction and minimize the effect of the mandated drawdown in personnel.

In their ROI analysis, DVSTA estimates a 60-year payback period by simply dividing the nonrecurring costs of $304 million by the estimated annual savings of approximately $5.2 million. DVSTA did not use the more accepted discounting approach (net present value), nor did DVSTA adjust for nonrecurring savings or other changes and recurring costs prior to reaching the steady-state phase for recurring savings. The approach DVSTA did use greatly increased the payback period.

B. NAVAL UNDERWATER SYSTEMS CENTER-NEW LONDON

1. Background

The Navy has proposed that the Naval Underwater Systems Center (NUSC) detachment at New London, CT, be disestablished as a separate activity. Most current functions are proposed to be transferred to the new Combat and Weapon Systems Division, Newport, RI, a part of the new Naval Undersea Warfare Center (NUWC). Of the 1,468 civilian positions at NUSC-New London, 156 will be eliminated to (partially) satisfy the congressionally-directed 20% reduction to acquisition personnel, 128 will be eliminated as "consolidation savings," 400 will be retained at New London for "wet work" support to the NUWC, and 734 will be transferred to Newport and 50 to Dahlgren, VA. The Navy proposal assumes that the 784 transferred positions will be filled by 484 personnel from New London and 300 new hires at the gaining installations. The proposal also assumes, through use of standard factors, that 428 Navy civilians will leave the NUSC payroll (81 due to normal turnover, 174 to early retirement, 114 to resignations, and 59 to reduction-in-force). In addition, 15 military positions will be eliminated. The military positions have almost no quantitative impact on this analysis (less than 10% of payroll savings are due to military positions) and are not addressed further here. Using COBRA, the Navy estimated the one-time costs as $59.5 million. The one-time military construction cost avoidance is $12.6 million, and recurring savings are $7.2 million per year, yielding a break-even point of 12 years and a (discounted) net present value over 20 years of $10.9 million (savings).

The National Interest Coalition (a New London-based organization, hereafter referred to as "the Coalition") is the principal spokesman for those hoping to retain the activity of NUSC at New London. The Coalition's main arguments included: sensitivity of the economic pay back to one-time costs; need for retention of support personnel at New

London; appropriateness of a construction cost avoidance claimed by the Navy; and overly optimistic assumptions regarding the willingness of scientists and engineers to relocate to Newport.

2. Items Reviewed

Our analysis focused on the cost methodology inherent in the COBRA model, the input data used by the Navy to define the proposal, and the issues identified by the National Interest Coalition. We reviewed the general documents described in Section I and the following additional data more specifically related to NUSC:

- Input to and output from the COBRA model, for NUSC, provided by the Navy staff
- National Interest Coalition letter to the Defense Base Closure and Realignment Commission, "Realignment of NUSC New London Laboratory," 24 May 1991
- Background material provided to the Advisory Commission on the Consolidation and Conversion of Defense Research and Development Laboratories by Congressman Sam Gejdenson
- Extract of "Department of the Navy Base Closure and Realignment" Recommendations Detailed Analysis, April 1991
- "Consolidation Cost Analysis Study," performed by NUSC, 15 April 1991.

While we reviewed the overall application of the COBRA model to this proposed consolidation, we placed special emphasis on high-value cost/savings items and on those items for which the Coalition had expressed doubts. Those items included the construction cost per square foot, administrative and support costs, personnel moving costs, other personnel costs, construction avoidance savings, and recurring savings. Manpower data available to IDA did not identify the composition (i.e., scientists, engineers, and direct mission support versus base support personnel) of the manpower positions that were retained, realigned, or abolished. Further, facility requirements were identified in aggregate terms (square feet of new construction and renovation), broken down by general class (administrative versus R&D) and not by specific facility. The absence of detailed data limited our work to checks of the sensitivity of the Navy analysis to variations in key parameters, and to qualitative assessments of the reasonableness of the underlying assumptions.

3. Major Findings

Overall, we found the Navy cost estimate to be reasonable. Although some risk exists in the areas of support personnel and construction funding estimates, we view the economic risks as manageable within the resource requirements identified by the Navy cost analysis. Iterations performed by IDA indicated that potential variations in the assumptions and methodology might extend the break-even point but were unlikely to discredit the proposal economically. The excursions performed by the Coalition are mathematically correct, and do cause the proposal to become a "money loser," but we found no basis for accepting these excursions as valid. Table 3 summarizes the Navy and Coalition positions.

Table 3. NUSC Cost Comparison (Millions of FY 1992 Dollars)

	Navy	Coalition
One-Time Costs		
Construction	34.8	
Equipment Move	9.9	
Personnel Move (Civilian)	9.2	
Other Civilian Personnel Costs	3.8	
Other	1.8	
Total One-Time Cost	59.5	59.5
Recurring Savings		
Civilian Salaries	5.3	
Other	2.0	
Total Recurring Savings	7.3	3.2 to 5.7
Other Issues		
Construction Avoidance	12.6	0.0
Net Present Value at 20 Years	-10.8	+26 to -2
Break-Even Point (Years)	12	19 to never

a. Military Construction Costs

The Navy proposed building 126 thousand square feet of RDT&E space at $233 per square foot at Newport. An additional 25 thousand square feet would be rehabilitated as RDT&E space at $140 per square foot. Lastly, 5 thousand square feet of administrative space would be constructed at $192 per square foot. The total construction cost is $34.8 million (line 2, Table 3). We compared the COBRA model cost per square foot for R&D facilities at NUSC-New London to the current plant value per square foot of RDT&E facilities at NUSC-New London. The COBRA model costs are $196 per square foot compared to a CPV of $166 per square foot, both values being for similar facilities at New

London. We concluded that the COBRA model generates reasonable costs per square foot for facilities of the type currently used by NUSC-New London, and, by inference, of the type to be built at Newport.

The Coalition did not take specific issue with facility construction costs at Newport, but did point out that a 35% increase in one-time costs (which are dominated by construction) would negate any long-term savings. As an excursion, we calculated the break-even point for this case. A 70% increase in construction costs increases one-time costs by about 35%, and extends the break-even point from 12 years (Navy) to 50 years (which, as a practical matter, says the move never really breaks even). Notwithstanding this excursion, IDA found no basis for believing construction requirements would exceed those identified by the Navy; we, therefore, accept the Navy's construction estimate as reasonable.

b. Other One-Time Costs

We found that the Navy's personnel movement costs (line 4, labelled "Personnel Move (Civilian)" in Table 3) were properly calculated, given the Navy assumptions about numbers of people moving. The Coalition estimates that few people will move. Greater than expected resistance to moving would transfer one-time costs from "Personnel Move" to "Other Civilian Personnel Costs" (line 5), which include reduction-in-force pay, early retirement charges, etc. However, the total costs do not change appreciably. (In fact, it is less expensive to "not move" people than to move people. Fundamentally, the willingness of the professional work force to move is an efficiency and retention of technical capability issue, rather than a cost analysis issue.) Our review of other personnel costs suggested that the COBRA model might be underestimating the costs of early retirements. As a test of reasonableness, we increased these costs by a factor of five (by about $5 million). The resulting break-even point was 15 years instead of the base case value of 12 years, a relatively insignificant change. Finally, the other costs (line 6) are principally administrative support (to the consolidation activity) and were properly calculated.

In summary, the overall one-time costs are reasonable, and the issues raised by the Coalition that pertain to one-time costs do not materially affect the economics of this consolidation.

c. Recurring Savings

Recurring savings are the net of $5.3 million in civilian salaries (the 128 positions "saved") and $3.8 million of support savings at New London, offset by $1.8 million of additional support costs incurred at Newport. Basically, all the values are driven in the COBRA model by the number of positions saved and the average salary. The Navy used the Industrial Fund average salary of about $41,400. We accepted this as reasonable. (In the event the actual average salary were higher, the one-time costs would increase only slightly, but the recurring savings would increase 7.5% for every 10% increase in average salary—in other words, this Navy assumption is viewed as conservative.) The Coalition argued that much of the claimed savings of 128 positions is illusory—that most of those positions would need to be retained at New London to support the 400 people staying there for "wet work." Mathematically, the proposed consolidation ceases to be economical if the positions saved decrease by 50%, which the Coalition believes to be the situation. Information available to IDA provided no basis, however, for concluding that the Navy could not properly support its overall technical operations subsequent to implementing the 128 position savings. Therefore, we accepted the Navy estimate as reasonable.

d. Construction Avoidance

The Navy analysis took credit for avoidance of construction of a $12.6 million facility at New London. The facility in question is a new Towed Array facility, programmed for FY94 at $14.3 million ($12.6 million in FY92 dollars). The Coalition claims that the need for the facility has been eliminated because of end-strength reductions planned for New London, without regard to consolidation, and that the foregone construction should therefore not be taken as a "consolidation savings." Accepting the Coalition position would move the break-even point from 12 to 20 years, which is a very long payback period. Regardless, even without this cost avoidance, the proposed realignment eventually breaks even from an analytical perspective. Moreover, the Navy position is that the facility would continue to be needed at New London in the event of an "in place" 20% work force reduction, but would become unnecessary under the proposed consolidation. We did not have detailed descriptive material for the facility, but would observe that many R&D facility requirements are driven by technology needs rather than by head count. We accepted the Navy position, but while the savings contribute to making the proposed consolidation economical, they are not essential to achieve a finite payback period.

C. NAVAL SURFACE WEAPONS CENTER-WHITE OAK

1. Background

The realignment of Naval Surface Weapons Center activities from White Oak to Dahlgren consists of four personnel actions: reducing the number of R&D spaces by 204 (11% of the current civilian staff of 1,803), saving 157 spaces through consolidation (9% of the current staff), leaving the 550 people from the Research Directorate (including 100 maintenance people) at White Oak, and realigning the remaining 892 spaces to Dahlgren. The Navy estimates that 555 of these new spaces will be filled by White Oak personnel moving to Dahlgren, leaving the remaining 337 spaces to be filled by new hires. The 494 personnel not moving (1803 – 204 – 550 – 555) consist of 93 normal rotations, 200 retirements, 133 quits, and 68 not willing to move (treated as reduction in force). The realignment will also include moving equipment from White Oak, and building 100,000 square feet of new military construction at Dahlgren. Other costs in the Navy estimate is the construction of a new $30 million sewage treatment plant at Dahlgren.

The Navy estimates the realignment will involve $89 million of one-time costs (i.e., during the 6-year realignment period), $28 million of one-time savings, and $11.2 million of annual savings, resulting in an ROI payback period of 18 years after the realignment is completed. Representative Constance A. Morella has challenged the Navy's analysis by providing much higher cost estimates that yield an infinite payback period (payback will never occur). In the subsections that follow, these figures are referred to as estimates by the "opponents" of the Navy plan.

2. Items Reviewed

Our assessment of the Navy's cost estimates consisted of four steps: (1) reviewing the output of the COBRA model, (2) discussing the COBRA methodology with OP-443, (3) discussing the Navy's inputs to the COBRA model with the Naval Sea Systems Command (NAVSEA), and (4) studying the alternative cost analysis offered by the opponents, specifically the numerical analysis contained in testimony before the Base Closure and Realignment Commission on 22 May 1991.

3. Major Findings

Our analysis finds that the Navy's costs (Table 4) are underestimated in some categories, but include the full costs of a $30 million sewage treatment plant that are not all chargeable to realignment.

Table 4. NSWC Cost Comparison (Millions of FY 1992 Dollars)

	Navy	Opponents
One-Time Costs (During Years 1–6)		
MILCON R&D Space	14.7	51.9
Administrative and Planning Support	10.9	
Personnel Moving	13.3	8.0
Equipment Moving		12.0
Administrative Support	0.1	
Special	10.8	
Civilian Personnel		
Rotation		
Retirement	1.8	
Not Moving (Reduciton in Force)	1.5	13.1
Quit	0.5	
Unemployment	0.4	
New Hires		12.5
Special One-Time		
Sewage Treatment	30.0	33.0
Trailers	2.0	3.0
Other	3.0	
New Equipment Purchase		10.0
Total One-Time Cost	89.0	143.5
One-Time Savings (During Years 1–6)	28.1	28.1
Annual Savings (After Alignment)	11.2	-0.4
Payback Period (Years)	18	—

On the other hand, the infinite payback period in the opponents' analysis is based on cost estimates that are not adequately supported. The $52 million cost of military construction, which accounts for $37 million of the $55 million difference in one-time costs, is based on an unsubstantiated need for building 300,000 square feet, three times the Navy estimate. Another $9 million of the difference in one-time costs of $55 million is due to high civilian personnel costs that are based on two questionable assumptions: first, that only 30% of White Oak will move, an average from corporate experience that does not consider the tight labor market due to recent defense cuts; and second, that each person not

moving to Dahlgren will receive $21,000 severance, which ignores the much smaller pay for personnel who are rotating (who receive nothing), quitting (who receive only back annual leave), and retiring.

Finally, the opponents argue that the $11.2 million annual savings claimed by the Navy will become a $0.4 million annual *loss* because of the $11.6 million cost to support the residual 550 people remaining at White Oak. The $11.6 million is a proportional share of the current $38.5 million support cost at White Oak. This criticism reflects a misunderstanding of the COBRA model. It is true that the personnel tabulations do not list support people for the 550 residual force, but the cost calculations provide both payroll and non-payroll budget to obtain a good deal of support. First of all, the payroll savings are calculated by simply multiplying the number of positions saved through consolidation (157) by an average salary. There is no restriction on how the remaining personnel would be distributed between mission and support people. The Navy could choose whatever support ratio is appropriate.

As to the non-payroll costs, the appropriations detail of the COBRA output shows that the Navy is actually leaving a substantial sum—even more than a proportional share—for Base Operating Support (BOS). The saving of 42% ($7.793 million out of the current level of $18.388 million) is much lower than the personnel reduction of 69% (1,800 down to 550 people). (The smaller reduciton in BOS is consistent with the common analytical finding of positive economies of scale in BOS.) The Navy figures also leave a substantial budget for non-personnel Real Property Maintenance Activities (RPMA) support, since these savings of 62 percent ($1.898 million of the $3.076 current level) are also less than the 69% cut in personnel.

There is a complementary picture at Dahlgren; a 13% increase in non-personnel BOS (from $31.077 million to $35.114 million) to accommodate a 23% increase in personnel (892 higher than the current 3,900), and a 4% increase in non-personnel RPMA (from $5.579 million to $5.778 million) to accommodate the 4% increase in current plant value from consolidation ($14.67 million higher than the current $412.037 million).

As a sensitivity analysis, we conducted a "worst case" estimate, and found that even with the extreme assumptions, the realignment still yielded a non-infinite payback period of 28 years. This case differed from the Navy analysis in these respects. The research-specific part of the Navy's military construction of 100,000 square feet was priced out at $420 per square foot to accommodate potentially increased costs for highly technical

laboratories. This estimate is more than double the $196 per square foot the Navy used in the COBRA model. We assumed a one-time bonus to induce 337 additional people to move to Dahlgren, removing the need for new hires. The bonus was calculated at 25% of a GS 14-5 yearly salary of $60,000, and paid to *all* movers, including the 555 people the Navy estimates will move to Dahlgren in the absence of a bonus. The total personnel costs of this "worst case," which include the moving costs for the extra 337 people, are over twice the total personnel cost of the Navy estimate, and approximately 9% higher than the total personnel cost in the estimate offered by the opponents.

Our "worst case" included the $10 million suggested by Representative Morella for the purchase of new equipment at Dahlgren. It does not, however, include the cost of a new sewage treatment plant at Dahlgren. Although plans are not yet settled, it appears that Dahlgren will have to build a new plant even in the absence of consolidation, to answer environmental concerns of the state of Virginia. Accommodating the current staff of 3,900 would require a plant with a capacity of 400,000 gallons per day. With the increases in staff resulting from the anticipated base realignments, however, Dahlgren might have to select a design of 600,000 gallons per day instead. The Dahlgren environmental officer estimates that the marginal cost of the extra capacity would be only a couple of million dollars. Even this overstates the cost attributable to the White Oak-Dahlgren consolidation, since Dahlgren will grow also because of personnel realignments from New London, San Diego, and Panama City. Moreover, there has been some thought of building a larger plant anyway, to anticipate unspecific future growth.

In summary, our analysis suggests that the payback period for the realignment from White Oak to Dahlgren lies somewhere in the range of 18–28 years as defined by the Navy and "worst case" estimates. The opponents' estimate, which yields an infinite payback period, is based on unsubstantiated assumptions regarding the square footage of military construction, the numbers of personnel receiving severance pay, the chargeable (to realignment) cost of the sewage treatment plant, and a misunderstanding of the Navy's treatment of BOS cost.

D. OTHER

1. David Taylor Research Center-Annapolis

From a cost point of view, there is a single point of contention concerning the realignment of the David Taylor Research Center in Annapolis, MD, to Bethesda, MD.

Congressman C. Thomas McMillen of Maryland raised in testimony the issue of a $24 million bill for environmental clean-up at Annapolis if the activity is realigned. The ground rules for this round of base closures and realignments were that such environmental clean-up costs were not to be included inasmuch as the clean-up is required regardless of the move. In the absence of other information to the contrary, the Navy's estimate of $48 million is deemed reasonable.

2. Combat Materiel Research Laboratory

The U.S. Army Laboratory Command, Adelphi, MD, gave IDA a briefing and detailed estimates concerning the realignment of the Combat Material Research Laboratory (CMRL). The details are part of the draft Combat Materiel Research Laboratory Implementation Plan, 27 August 1991. The Army has been working on laboratory realignment since 1989 and its estimates go beyond the use of standard factors such as those employed by the COBRA model. Indeed standard factors caused a problem as the Army had specific, detailed estimates and phasings and had to develop workarounds, such as inflating the number of square feet of construction required, in order for the COBRA model to approximate the Army cost analysis.

We found no problem with the Army analysis. Opponents of the consolidation of the Electronics Technology and Devices Laboratory with CMRL, Adelphi, questioned the advisability of moving it from its proximity to the Communications-Electronics Command with which it is now co-located at Ft. Monmouth, NJ. We did not examine this issue because it is not a cost issue.

3. Aircrew Training Research Facility

The Aircrew Training Research Facility is a tenant unit on Williams Air Force Base, AZ. The Air Force recommended the closure of Williams in FY93. As a result, the Air Force intends to move the facility to the Naval Training Center in Orlando, Florida. The transfer is anticipated to involve 39 civilian and 17 military personnel at an estimated cost of about $10 million. There were no cost issues identified with this move.

VI. CONCLUSIONS

Our review of the cost-estimating methodologies employed by the services in preparing cost and savings estimates for the proposed closures and realignments resulted in the following conclusions:

- In general, service cost estimates were in compliance with established DoD guidelines and procedures and were reasonable.
- From a cost perspective, the major drivers in realignments are construction costs and the number of positions being eliminated.
- The COBRA model used by the services generally provided reasonable cost and savings estimates; however, when the specific realignment scenarios deviate significantly from the average COBRA factors, adjustments should be made. We also noted some limitations in the model that should be corrected.
- The criticisms from opponents of the laboratory realignments could not always be substantiated and were not sufficient to overthrow the service estimates.
- Laboratory realignments do not save large sums of money and would be questionable if savings were the only or primary driver of the decision. Theoretically, these realignments are designed to provide more relevant technology and, in the long term, will not be money-losing propositions. In this context, decisions are driven by effectiveness with cost considerations being neutral.

ABBREVIATIONS

ABBREVIATIONS

AFB	Air Force Base
APG	Aberdeen Proving Ground
BOS	Base Operating Support
BRAC	Base Closure and Realignment Commission
CMRL	Combat Material Research Laboratory
COBRA	Cost of Base Realignment Action
COE	Corps of Engineers
CPV	current plant value
DoD	Department of Defense
DVSTA	Deleware Valley Science and Technology Association
FAR	Federal Acquisition Regulations
GAO	Government Accounting Office
IDA	Institute for Defense Analayses
LMI	Logistics Management Institute
NADC	Naval Air Development Center
NATC	Naval Air Test Center
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAWC	Naval Air Warfare Center
NESEA	Naval Electronic Systems Engineering Activity
NPV	net present value
NSWC	Naval Surface Weapons Center
NUSC	Naval Underwater Systems Center
NUWC	Naval Underwater Warfare Center
OSD	Office of the Secretary of Defense
R&D	research and development
RDT&E	research, development, test and evaluation
ROI	return on investment
RPMA	Real Property Maintenance Activities
SPAWAR	Space and Naval Warfare Systems Command